

## CLAIMS

What is claimed is:

1. A rotary compressor, comprising:
  - a rotating shaft having first and second eccentric parts;
  - a reversible motor to rotate the rotating shaft in either a first rotating direction or a second rotating direction;
  - a first cylinder comprising:
    - a first compression chamber in which a refrigerant compression stroke or an idle stroke is performed in accordance with the first or second rotating direction of the first eccentric part of the rotating shaft;
    - a first intake port to suck a refrigerant into the first compression chamber; and
    - a first exhaust port to discharge the refrigerant from the first compression chamber after the refrigerant is compressed;
  - a second cylinder comprising:
    - a second compression chamber in which the refrigerant compression stroke or the idle stroke is performed in accordance with the first or second rotating direction of the second eccentric part of the rotating shaft, such that first and second compression chambers alternately perform the compression stroke and the idle stroke;
    - a second intake port to suck the refrigerant into the second compression chamber; and
    - a second exhaust port to discharge the refrigerant from the second compression chamber after the refrigerant is compressed;
  - a first sub-path which allows a predetermined point of the first compression chamber to communicate with the first intake port so as to control a compression capacity of the first compression chamber; and
  - a path control unit to control an opening ratio of the first sub-path.
2. The rotary compressor according to claim 1, wherein the first sub-path comprises:

a first sub-path pipe provided to allow the predetermined point of the first compression chamber to communicate with the first intake port, or a first sub-path groove provided in the first cylinder to allow the predetermined point of the first compression chamber to communicate with the first intake port.

3. The rotary compressor according to claim 1, further comprising:

a second sub-path which allows a predetermined point of the second compression chamber to communicate with the second intake port so as to control a compression capacity of the second compression chamber, the second sub-path being controlled in an opening ratio thereof by the path control unit.

4. The rotary compressor according to claim 3, wherein the second sub-path comprises:

a second sub-path pipe provided to allow the predetermined point of the second compression chamber to communicate with the second intake port, or a second sub-path groove provided in the second cylinder to allow the predetermined point of the second compression chamber to communicate with the second intake port.

5. The rotary compressor according to claim 3, wherein the path control unit comprises:

first and second path control units which control the opening ratios of the first and second sub-paths, respectively.

6. The rotary compressor according to claim 1, wherein the first and second compression chambers have different compression capacities.

7. A rotary compressor, comprising:

a rotating shaft;

a reversible motor to rotate the rotating shaft in either a first rotating direction or a second rotating direction;

first and second compression chambers in which a refrigerant compression stroke and an idle stroke are alternately performed in accordance with the first rotating direction or second rotating direction of the rotating shaft;

a first sub-path which allows a predetermined point of the first compression chamber to communicate with a refrigerant intake side of the first compression chamber so as to control a compression capacity of the first compression chamber;

a second sub-path which allows a predetermined point of the second compression chamber to communicate with a refrigerant intake side of the second compression chamber so as to control a compression capacity of the second compression chamber; and

a path control unit to control opening ratios of the first and second sub-paths.

8. The rotary compressor according to claim 7, wherein a capacity ratio of the first and second compression chambers is in a range of 2.1:1 to 1.9:1.

9. The rotary compressor according to claim 7, wherein the predetermined point of the first compression chamber is determined such that the compression capacity of the first compression chamber, in a state that the first sub-path is opened by the path control unit, is reduced in a range of 20% to 30% compared with the compression capacity of the first compression chamber in a state that the first sub-path is closed.

10. The rotary compressor according to claim 7, wherein the predetermined point of the second compression chamber is determined such that the compression capacity of the second compression chamber, in a state that the second sub-path is opened by the path control unit, is reduced in a range of 40% to 60% compared with the compression capacity of the second compression chamber in a state that the second sub-path is closed.

11. A rotary compressor, comprising:

a rotating shaft having first and second eccentric parts which rotate thereby;

a first compression chamber in which a refrigerant compression stroke or an idle stroke is performed in accordance with a first rotating direction or a second rotating direction of the first eccentric part of the rotating shaft to selectively compress a refrigerant in the first compression chamber;

a second compression chamber in which the refrigerant compression stroke or the idle stroke is performed in accordance with the first rotating direction or the second rotating direction of the second eccentric part of the rotating shaft to selectively compress a refrigerant in the second compression chamber, such that first and second compression chambers alternately perform the refrigerant compression stroke and the idle stroke; and

a compression capacity controller to control a compression of the first compression chamber.

12. The rotary compressor according to claim 11, wherein:

the compression capacity controller comprises:

a first sub-path, and

a path control unit to control an opening ratio of the first sub-path

the first compression chamber comprises a first intake port to suck the refrigerant into the first compression chamber, the first sub-path allowing a predetermined point of the first compression chamber to connect to the first intake port.

13. The rotary compressor according to claim 12, wherein the first sub-path comprises a first sub-path connector connectable with the predetermined point of the first compression chamber and the first intake port.

14. The rotary compressor according to claim 12, wherein:

the compression capacity controller further comprises a second sub-path controlled in an opening ratio thereof by the path control unit; and

the second compression chamber comprises a second intake port to suck the refrigerant into the second compression chamber, the second sub-path allowing a predetermined point of the second compression chamber to connect to the second intake port so as to control a compression capacity of the second compression chamber.

15. The rotary compressor according to claim 14, wherein the second sub-path comprises a second sub-path connector connectable with the predetermined point of the second compression chamber and the second intake port.

16. The rotary compressor according to claim 14, wherein the path control unit comprises first and second path control units which control the opening ratios of the first and second sub-paths, respectively.

17. The rotary compressor according to claim 11, wherein the first and second compression chambers have different compression capacities from each other.

18. The rotary compressor according to claim 11, wherein the second compression chamber has a compression capacity smaller than that of the first compression chamber.

19. The rotary compressor according to claim 11, wherein the second compression chamber has a compression capacity about a half of a compression capacity of the first compression chamber.

20. The rotary compressor according to claim 11, further comprising:  
a first roller piston fitting over the first eccentric part of the rotating shaft in the first compression chamber;  
a first gap defined between the first roller piston and the first eccentric part, and eccentric in a shape thereof; and  
a first cam bush having an eccentric shape and fitting in the first eccentric gap between the first eccentric part and the first roller piston in the first compression chamber.

21. The rotary compressor according to claim 20, wherein, when the rotating shaft rotates in the first rotating direction, the first cam bush causes an eccentric rotation of the first roller piston to perform the compression stroke in the first compression chamber.

22. The rotary compressor according to claim 20, wherein, when the rotating shaft rotates in the second rotating direction, the first cam bush causes a concentric rotation of the first roller piston to perform the idle stroke in the first compression chamber.

23. The rotary compressor according to claim 20, further comprising:  
a second roller piston fitting over the second eccentric part of the rotating shaft in the second compression chamber;  
a second gap defined between the second roller piston and the second eccentric part, and eccentric in a shape thereof; and  
a second cam bush having an eccentric shape and fitting in the second eccentric gap between the second eccentric part and the second roller piston in the second compression chamber.

24. The rotary compressor according to claim 23, wherein, when the rotating shaft rotates in the second rotating direction, the second cam bush causes an eccentric rotation of the second roller piston to perform the compression stroke in the second compression chamber.

25. The rotary compressor according to claim 23, wherein, when the rotating shaft rotates in the first rotating direction, the second cam bush causes a concentric rotation of the second roller piston to perform the idle stroke in the second compression chamber.

26. The rotary compressor according to claim 14, wherein a capacity ratio of the rotary compressor is settable based on the opening ratios of the first and second sub-paths within a range of 4:1.

27. A rotary compressor, comprising:  
a rotating shaft rotating therein;  
first and second compression chambers in which a refrigerant compression stroke and an idle stroke are alternately performed in accordance with a first rotating direction or a second rotating direction of the rotating shaft;

one or more sub-paths to connect one or more predetermined points of respective one or ones of the first and second compression chambers to respective one or ones of a refrigerant intake side of the first and second compression chambers so as to control respective one or ones of compression capacities of the first and second compression chambers; and  
a path control unit to control opening ratios of the one or more sub-paths.

28. The rotary compressor according to claim 27, wherein a capacity ratio of the first and second compression chambers is in a range of 2.1:1 to 1.9:1.

29. The rotary compressor according to claim 27, wherein a respective predetermined point of the first compression chamber is determined such that the compression capacity of the first compression chamber, in a state that one sub-path, corresponding to the first compression chamber, is opened by the path control unit, is reduced in a range of 20% to 30% compared with the compression capacity of the first compression chamber in a state that the one sub-path is closed.

30. The rotary compressor according to claim 27, wherein a respective predetermined point of the second compression chamber is determined such that the compression capacity of the second compression chamber, in a state that a further sub-path, corresponding to the second compression chamber, is opened by the path control unit, is reduced in a range of 40% to 60% compared with the compression capacity of the second compression chamber in a state that the further sub-path is closed.

31. A rotary compressor, comprising:  
a rotating shaft rotating therein;  
plural compression chambers in which a refrigerant compression stroke and an idle stroke are performed in accordance with a first rotating direction or second rotating direction of the rotating shaft;

one or more sub-paths to connect one or more predetermined points of respective one or ones of the plural compression chambers to a refrigerant intake side of the plural compression chambers so as to control respective one or ones of compression capacities of the plural compression chambers; and

a path control unit to control opening ratios of the one or more sub-paths.

32. A rotary compressor, comprising:

plural compression chambers in which a refrigerant compression stroke and an idle stroke are performed in accordance with a first rotating direction or second rotating direction of the rotating shaft; and

one or more sub-paths, respectively, connectable to the plural compression chambers to vary a refrigerant compression capacity thereof to set a total capacity of the rotary compressor between at least four stages based on a direction of a rotation of the rotating shaft and a connection status of each of the one or more sub-paths.

33. A method of operating a rotary compressor having a rotating shaft with first and second eccentric parts to rotate thereby, first and second compression chambers in which a refrigerant compression stroke or an idle stroke is performed in accordance with a rotating direction of the first and second eccentric part, respectively, the first and second compression chambers, alternately, performing the compression stroke and the idle stroke, and first and second sub-paths, respectively, allowing a predetermined point of the first and second compression chambers to connect to a intake side of the rotary compressor, comprising:

when operating in a first stage, in which the rotating shaft rotates in a first direction, performing the compression stroke in the first compression chamber, while performing the idle stroke in the second compression chamber and closing a first sub-path to maximize a compression capacity of the rotary compressor;

when operating in a second stage, in which the rotating shaft rotates in a first direction, performing the compression stroke in the first compression chamber, while performing the idle stroke in the second compression chamber and opening a first sub-path to reduce the compression capacity of the rotary compressor by about 25% from that of the compression capacity of the rotary compressor operating in the first stage;



when operating in a third stage, in which the rotating shaft rotates in a second direction, performing the idle stroke in the first compression chamber, while performing the compression stroke in the second compression chamber and closing the second sub-path to reduce the compression capacity of the rotary compressor by about 50% from that of the compression capacity of the rotary compressor operating in the first stage; and

when operating in a fourth stage, in which the rotating shaft rotates in the second direction, performing the idle stroke in the first compression chamber, while performing the compression stroke in the second compression chamber and opening the second sub-path to reduce the compression capacity of the rotary compressor by about 75% from that of the compression capacity of the rotary compressor operating in the first stage.